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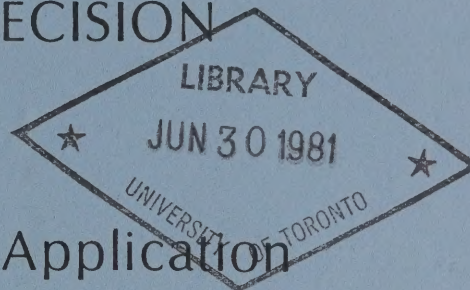


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2 NATIONAL ENERGY BOARD
3 REASONS FOR DECISION



In the Matter of the Application
under Parts I, III and VI
of the National Energy Board Act

of

Ontario Hydro

May 1981

NATIONAL ENERGY BOARD

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In the Matter of the Application under
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ONTARIO HYDRO

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Ce rapport est publié
séparément dans les deux
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IN THE MATTER OF the National Energy Board
Act and the Regulations made thereunder,
and

IN THE MATTER OF an application by Ontario
Hydro for an Order, a Certificate and
Licences pursuant to Parts I, III and VI
of the said Act, filed with the Board
under File No. 1923-4/O5-6.

HEARD at Ottawa, Ontario on 17, 18, 19, 20, 23, 24, 25, 26 and
27 March 1981.

BEFORE:

L.M. Thur)	Presiding Member
J.L. Trudel)	Member
R.B. Horner)	Member

APPEARANCES:

P. Genest, Q.C.)	Ontario Hydro
I.A. Blue)	
R. Elliott)	The Association of Major
)	Power Consumers of Ontario
R. Timberg)	Energy Probe
F. Gertler)	
J.M. Johnson, Q.C.)	The Minister of Energy
M.C. Rounding)	for Ontario
S.K. Fraser)	National Energy Board

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ABBREVIATIONS USED IN THE REPORT

For Units of Measurement

km	kilometre
kV	kilovolt
kW.h	kilowatt hour
GW.h	gigawatt hour
MVA	megavolt ampere
MW	megawatt

For Names

Act	National Energy Board Act
AMPCO	The Association of Major Power Consumers in Ontario
Applicant	Ontario Hydro
Board	National Energy Board
Niagara Mohawk	Niagara Mohawk Power Corporation
NYPP	New York Power Pool
PASNY	The Power Authority of the State of New York
U.S.	United States of America

CHAPTER 1

BACKGROUND

Ontario Hydro is a statutory corporation established in 1906 by the Provincial Legislature. It has broad powers to produce, buy, and deliver electric power throughout the province and currently operates under The Power Corporation Act, Revised Statutes of Ontario 1970, c. 354 as amended.

The corporation's main responsibility is to provide power to municipalities, which in turn distribute the power to their own customers. In addition, Ontario Hydro supplies more than 100 major industrial customers and about 771 000 retail customers either in rural areas or in communities not served by municipal electric utilities.

Ontario Hydro has developed an integrated bulk power system in which over seventy generating stations are interconnected with load centers by a network of transmission lines and switching stations. The system includes power transmission lines operating from 115 kV up to 500 kV, with most of the lines operating at 230 kV. Peak demand reached 17 211 MW in January 1981. Primary energy demand during 1980 was approximately 100 000 GW.h.

Ontario Hydro owns and operates two power networks, the East System and the West System, which are connected by a double-circuit 230 kV transmission line. A map of Ontario Hydro's major facilities appears in Appendix 1. Appendix 2 gives the capacity of its generating stations.

Ontario Hydro's East System constitutes the major portion of the Ontario integrated bulk power system covering the area east of Wawa to the Quebec border. Thirteen ties with Quebec interconnect radially with isolated generation or small sub-systems which are electrically separate from the main system in Quebec.

The West System, comprising about one twentieth of the load in the province, includes approximately all the area west of Wawa. It is interconnected with Manitoba Hydro by two 230 kV circuits and one additional interconnection which can be tied radially to generation in Manitoba to provide power to the Ontario Hydro system on the 115 kV network.

The Ontario Hydro system is interconnected with the systems of The Power Authority of the State of New York, Niagara Mohawk, and The Detroit Edison Company in the United States. PASNY and Niagara Mohawk are participants in the New York Power Pool; Detroit Edison and its neighbouring utility, Consumers Power Company, constitute the Michigan Electric Coordinated System. A list of Ontario Hydro's international power lines appears in Appendix 3. Ontario Hydro operates synchronously with an international electrical network which includes most of the power systems in Canada and the United States east of the Rocky Mountains.

Ontario Hydro currently holds two major export licences. One is EL-94 which authorizes the export of up to 8000 GW.h per 12-month period of unscheduled circulating power for simultaneous return to Canada (loop flow). EL-94 will expire on 31 December 1985. The other is EL-95 which authorizes the

export of up to 15 000 GW.h per 12-month period of interruptible energy, usually as a sale transfer. EL-95 will expire on 30 June 1981.

CHAPTER 2

THE APPLICATION

Ontario Hydro has applied for the following authorizations:

Circulating Licence

A licence to authorize the export of up to 10 000 GW.h per consecutive 12-month period of unscheduled circulating power and energy for simultaneous return to Canada. The term would be 1 July 1981 to 31 December 1995. The licence would replace the existing Licence EL-94 and the Applicant indicated that if the Board were to approve the application for a new licence on the terms and conditions applied for, Ontario Hydro would consent to the revocation of Licence EL-94.

Interruptible Licence

A licence to authorize exports as sale, equichange, storage, adjustment and carrier transfers of interruptible power and energy up to a maximum of 20 000 GW.h per consecutive 12-month period until the end of 1983 and 25 000 GW.h per consecutive 12-month period thereafter. The term would be 1 July 1981 to 30 June 1991. The export quantity would be reduced by the actual amounts exported under the miscellaneous firm licence described below.

Miscellaneous Firm Licence

A licence to authorize in principle exports of blocks of firm power for periods ranging from six months to five years. Actual export contracts would be submitted individually for the Board's approval as they were entered into. Maximum exports in

any consecutive 12-month period would be 10 500 GW.h at a rate not to exceed 1200 megawatts. The overall term would be from 1 July 1981 to 30 June 1991.

Certificate

A certificate of public convenience and necessity to authorize the construction and operation of a new double-circuit 345 kV 60 Hz interconnection with the Power Authority of the State of New York at Niagara Falls. The line's construction would necessitate minor changes to the existing 230 kV international power lines authorized under Certificate EC-16. The application includes a request for an amending order for EC-16 should the certificate application be successful.

CHAPTER 3

THE EVIDENCE: EXPORT OF POWER AND ENERGY

3.1 Load Forecast

The Applicant submitted its latest short-range and long-range forecasts which were adopted by the Ontario Hydro Board of Directors for planning purposes early in 1981. The short-range forecast to 1985 is based on a survey of loads expected by Ontario Hydro's wholesale customers. The individual forecasts are summed, checked against historical records, and compared to the results of short-term projection models. The long-range forecast to the year 2000 is derived from a judgemental assessment of the results of a number of different approaches. These include a detailed engineering end-use model and several independent econometric models.

The resulting forecast is for peak demand to grow at an average annual rate of 3.1 percent from 1980 to 2000. In the shorter term, the expected annual growth is 3.3 percent to 1985 and 3.7 percent between 1985 and 1990, for an average during the requested licence period of 3.55 percent per year. The total system peak demand is expected to grow to 23 800 MW in the winter of 1990-91. Energy demand is forecast to reach 141 605 GW.h in 1990. The forecast for each year of the requested licence period for both the East and West Systems may be found in Appendix 5 for peak demand and Appendix 6 for energy.

A witness for the Applicant testified that the forecast has been reduced every year since 1974. He stated that this has

resulted in considerable surplus generating capacity on Ontario Hydro's system.

3.2 Generating Capacity and Surplus

A summary of the generating capacity available on Ontario Hydro's system appears in Appendix 2. At present, the total nameplate capacity is 24 743 megawatts. Appendix 4 shows the Applicant's generation expansion plan. The planned additions, consisting mainly of nuclear units, will increase the capacity to 32 759 MW by December 1990. The net dependable capacity in December of each year of the proposed export period is shown in Appendix 5.

Testimony shows that Ontario Hydro intends to continue with its nuclear expansion program in spite of its current over-capacity situation because it is expected that the cost of continuing with the program will be less than the cost of meeting the expected load from existing coal-fired generation, mainly due to the cost of coal. Ontario Hydro stated that it will "mothball" unneeded fossil-fired generating units. This refers to a process whereby the unit is placed in storage after steps are taken to minimize corrosion. Ontario Hydro explained that such units can be returned to operation in a matter of months should the need arise. They are therefore included in the available capacity shown in Appendix 5. The exact units to be mothballed will depend on a number of factors such as load growth, availability of nuclear generation, and export markets.

The surplus capacity resulting from the forecast load, required reserve, and available generation is shown in Appendix 5.

The figures show the peak demand for the East and West Systems for each year of the requested licence period. The annual peak demands do not necessarily occur on the same day in each system. Consequently, simple addition of the figures shown in Appendix 5 for each system would understate the expected surplus slightly.

3.3 Energy Balance and Surplus

Ontario Hydro's energy demand and generation capability under dependable streamflow conditions are shown in Appendix 6. Dependable streamflow conditions are defined as those which are exceeded 98 percent of the time. An additional 7700 GW.h per year would be available under median hydraulic conditions and a further 2780 GW.h would be available in years with high streamflows.

The energy capability figures shown in Appendix 6 are reduced from what they otherwise would have been by two factors. One is expected limitations on the transmission circuits from the Bruce Nuclear Generating Station. The evidence shows that as the Bruce B Nuclear Generation Station enters service, the existing transmission in the area will become fully loaded. Ontario Hydro estimates that the earliest year by which new transmission can be installed is 1989. This so-called bottleneck effect is taken into account in Appendix 6.

The other factor which will cause limitations in Ontario Hydro's generating capability is the Ontario Government's acid gas reduction program. The Applicant filed a copy of an Ontario Government Order in Council dated 17 February 1981

ordering that emissions of sulphur dioxide from Ontario Hydro's fossil-fired generating stations shall not exceed a total of 390 kilotonnes in each year from 1986 through 1989 nor 260 kilotonnes per year thereafter. In addition, annual emissions of nitric oxide are not to exceed 60 kilotonnes in the years 1986 through 1989 nor 40 kilotonnes thereafter. Ontario Hydro's estimate of total 1981 emissions of sulphur dioxide and nitrogen oxide is in the order of 600 kilotonnes, about 87 percent of which will be sulphur dioxide. An exhibit filed by Ontario Hydro indicates that it intends to comply with the emission limits by increasing purchases of hydraulic energy from neighbouring Canadian provinces and by increasing its use of low-sulphur coal. In addition, it plans to install low nitrogen oxide burners, scrubbers and flue gas treatment systems at its large coal-fired generating stations. The resulting reductions in energy availability are reflected in Appendix 6.

The expected available surplus energy under dependable streamflows ranges from 55 439 gigawatt hours in 1984 to 7700 gigawatt hours in 1990. The Applicant stressed that streamflows can normally be expected to be better than dependable, thus resulting in larger surpluses than those shown in Appendix 6.

3.4 Fuel Supply

The evidence indicates that almost all of the energy proposed for export would be generated at the Applicant's coal-fired generating stations. Testimony showed that small amounts

of nuclear energy could be exported, most likely during spring runoff.

The Applicant's fuel supply witness testified that Ontario Hydro's coal supply contracts have the capability of supplying between 10 and 14 teragrams of coal per year. He indicated that a teragram of coal represents approximately 3000 GW.h. He stated that the amount of coal needed to supply the Ontario load will vary between five and ten teragrams per year. Thus, there will be considerable coal available to generate electricity for exports. He indicated that it will not be difficult to pick up an additional two teragrams per year on the spot market if the export market for power is strong.

Meeting the Ontario Government acid gas emission limits will probably require Ontario Hydro to purchase coal with lower sulphur content. Testimony showed that the Applicant expects no difficulty in obtaining ample quantities of coal of the required quality.

In respect of other fuels, the witness testified that there are sufficient fuel supply arrangements in place for uranium and other fuels used by Ontario Hydro to meet domestic loads. He indicated that sufficient supplies of oil are readily available if export markets for oil-generated energy should materialize. Oil-fired generation is normally not used to supply Canadian loads because of high fuel costs.

3.5 Priority of Canadian Loads - Interruptibility

The application includes copies of letters to Manitoba Hydro, Hydro-Québec, The Great Lakes Power Corporation Limited,

Canadian Niagara Power Company Limited, St. Lawrence Power Company, The New Brunswick Electric Power Commission, and Saskatchewan Power Corporation. The letters included copies of the application and a request that the recipients indicate whether they had any interest in arranging to purchase firm electricity from Ontario Hydro. The letters further indicated that individual blocks of miscellaneous firm power proposed for export would be offered to accessible Canadian utilities as contracts were entered into, and that the proposed interruptible exports would continue to be subject to interruption by Canadian utilities as has been the practice in the past.

Replies to the Applicant's letters were included in the application. All the utilities receiving letters from Ontario Hydro indicated that the proposed arrangements are satisfactory. Hydro-Québec requested that any new licence for the export of miscellaneous firm power contain a condition requiring the export to be interrupted when, in the opinion of the Board, an unforeseen situation has caused or could cause an interruption in the supply of firm power to customers in accessible Canadian markets. The suggested condition is identical to one contained in Licence EL-96, which authorizes Hydro-Québec to export up to 800 MW and 3000 GW.h per year of firm power during the summer months. The condition was originally suggested by Ontario Hydro in its intervention at the hearing of Hydro-Québec's application for EL-96 in 1976.

Testimony showed that Ontario Hydro proposed to interrupt exports under the interruptible licence to supply

primary loads in Ontario or at the request of accessible Canadian utilities, and to interrupt exports under the proposed miscellaneous firm licence to supply primary loads in Ontario. According to the testimony, once the firm power and energy had been offered to and refused by neighbouring Canadian utilities it would not normally be interruptible at their request. However, a witness testified under cross-examination, that Ontario Hydro would accept the condition proposed by Hydro-Québec.

3.6 Export Markets

Ontario Hydro's principal export markets are in the States of New York and Michigan. Ontario Hydro is interconnected with The Detroit Edison Company which, together with Consumers Power Company, forms the Michigan Electric Coordinated System which serves most of the State. In 1978, the total generation of the Michigan Electric Coordinated System was 67 422 GW.h.

Ontario Hydro is also interconnected with Niagara Mohawk and PASNY, both of which are participants in the New York Power Pool. The eight members of the New York Power Pool operate their systems as an integrated pool to serve the entire state of New York. In 1979, total generation of the New York Power Pool was 117 713 GW.h.

In addition to the principal markets, Ontario Hydro might also supply power and energy to a large number of second-tier customers. Exports to these markets would be wheeled through either New York or Michigan. A witness testified that Ontario Hydro had held discussions with some 31 U.S. utilities concerning possible exports of miscellaneous firm power.

Specifically mentioned were the Vermont Public Power Supply Authority, the Vermont Public Service Board, and General Public Utilities which serves a part of Pennsylvania. The potential export to these three agencies totals 328 MW.

3.7 Licence Limits - Quantities and Terms

3.7.1 Circulating Licence

The requested licence limit of 10 000 GW.h per consecutive 12-month period is based on a maximum expected level of circulating power around the Great Lakes of 1100 MW. No net export is involved. The requested term would run until 31 December 1995, which is four and a half years after the proposed expiry date for the other two licences requested. The Applicant explained that the longer term was requested in order to allow Ontario Hydro to continue to derive the benefits of interconnected operation with U.S. utilities even if its authorization to make export sales were not renewed.

3.7.2 Interruptible Licence

The interruptible licence limits, which would include any quantities exported under the proposed miscellaneous firm licence, are based on the capacity of Ontario Hydro's interconnections with U.S. utilities. At present the capacity under normal conditions is 2600 MW. This figure would increase to 3200 MW at the end of 1983 if the certificate application were successful. The requested licence limits of 20 000 GW.h per consecutive 12-month period initially, increasing to 25 000 GW.h after 1983, are based on multiplying the international transfer capacity by the number of hours in a year.

The Applicant maintained that the interruptible and miscellaneous firm licence requests should be regarded as a package. Reasons behind the request for ten-year terms are outlined in the following section.

3.7.3 Miscellaneous Firm Licence

The requested licence limits of 1200 MW and 10 500 GW.h per consecutive 12-month period are based on the Applicant's analysis of its available surplus capacity and its assessment of the quantities the market might be able to absorb. The overall term would be ten years ending 30 June 1991 with individual blocks of export power to range in term from six months to five years. Testimony at the hearing indicated that five years would be sufficient to offer customers in the export market flexibility in scheduling construction of new generation, carrying out major overhauls, or repairing existing generation while at the same time not requiring Ontario Hydro to make overly long commitments. A witness testified that normal utility planning horizons are now ten years or longer and that a ten-year term would allow Ontario Hydro to compete effectively in the export market.

3.8 Export Prices

Capacity-type exports under the proposed licence for interruptible power and energy would be priced according to the relevant provision of Ontario Hydro's interconnection agreements which are summarized in Appendix 7. Applicable demand charges are set out in the agreements. Energy charges would be negotiated but would never be less than incremental cost plus ten percent. Incremental cost is defined as the sum of all the costs

incurred to make a sale, and includes 0.4 mill per kW.h for the social costs of coal-fired generation.

Economy sales under the interruptible licence would be priced according to the split-savings formula⁽¹⁾. Sales of economy energy are defined as those made to effect savings when the purchaser has sufficient generating capacity available to meet its load. A witness testified that Ontario Hydro does not make economy sales unless the profit is at least two mills per kW.h.

Prices for exports of miscellaneous firm power are to be negotiated. Testimony showed that, in principle, pricing of these exports would be based on a demand charge related to the amount of capacity reserved, plus an energy charge which would never be less than incremental cost plus ten percent. Individual miscellaneous firm contracts would be submitted for the Board's approval as they were entered into.

In order to demonstrate that its export prices would recover all costs incurred in Canada, Ontario Hydro stressed that energy would never be exported at less than cost plus ten percent. Capacity-type transactions would bear a demand charge in addition to the energy price.

In order to demonstrate that the export prices would be not less than the price for equivalent service to Canadians, the Applicant pointed out that all exports would be offered to

(1) Split-savings formula: $\text{Export price} = \frac{C + V}{2}$ where C = cost and V = value (to the purchaser).

neighbouring Canadian utilities under the same terms and conditions as the proposed export, before being committed to the export market.

Regarding alternative U.S. costs, the Applicant filed an analysis of interconnection agreements between U.S. utilities which shows that prices from U.S. sources are either the same as, or slightly higher than, Ontario Hydro's export prices. The Applicant pointed out that it is necessary to export at prices slightly less than U.S. alternatives in order to maximize revenues. Witnesses for the Applicant testified that Ontario Hydro monitors the alternative U.S. costs on a continuing basis and that the prices in its interconnection agreements are reviewed and renegotiated as necessary.

3.9 Profits and Benefits

Testimony showed that Ontario Hydro received \$1.2 billion in revenue from exports between 1976 and 1980. Of this amount, approximately \$500 million was profit. The profit reduced Ontario Hydro's revenue requirements by between five and seven percent per year, to the direct benefit of Ontario Hydro customers.

Witnesses testified that interconnected operation reduces the cost of service to Ontario customers in other ways. These include reduced operating reserve requirements, lower transmission losses, improved frequency stability, and, in some cases, improved voltage stability. A witness testified that Ontario Hydro allows for 700 MW of assistance over its interconnections in computing the generation required to meet its reliability criteria.

3.10 Environmental Effect of Exports

The application contains a statement that all the proposed exports will be supplied by increased utilization of facilities installed to meet Ontario requirements. Thus the environmental impact associated with export sales is confined to the incremental effects of increased output from existing plants.

Regarding atmospheric emissions, the Applicant engaged consultants to update studies made in 1974 for Ontario Hydro's previous application to the Board to analyse data on the environmental effects and social costs of atmospheric emissions. A summary of these social cost studies may be found in the following section of this report.

Regarding aqueous emissions, the application states that exports would create an increase in the quantity of heat and cooling water discharged. Cooling water discharges are monitored and controlled to meet the Ontario Ministry of Environment guidelines. The application states that there is no significant adverse effect on the aquatic environment resulting from thermal station operation to meet Ontario demands, and consequently, the incremental effects of operation for export will be minimal.

Regarding environmental effects of nuclear generation, the application states that even when operated at maximum capacity, Ontario Hydro's nuclear stations emit radionuclides at only a very small percentage of the Atomic Energy Control Board safety limits. Any incremental operations for export purposes would not increase radiological emissions above the current level and the additional impact would therefore be insignificant.

Witnesses outlined the Provincial and Federal environmental regulations to which Ontario Hydro is subject, and testified that its system is operated to meet all such regulations. The Applicant stressed that in the event any environmental standard was in danger of being exceeded, exports would be reduced or cut off completely.

3.11 Social Costs

The application includes updates of the social cost studies commissioned by Ontario Hydro prior to its 1975 application to the Board. Studies dealing with effects of emissions from coal-fired generation on human health, building materials, textiles, water quality, vegetation and animals, and property values are included in the application.

3.11.1 Human Health

Ontario Hydro's consultants were asked to do a survey of the literature on the effects of air quality on human health, to interpret the literature in relation to the situation in Ontario, and to assess social costs attributable to Ontario Hydro generation. The emphasis in the study was on the effects of the sulphur dioxide/particulate complex because the majority of epidemiological evidence is concentrated in this area. The consultants estimated social costs using three different methods based on the work of Lave and Seskin⁽²⁾. Lave and Seskin estimated that the total health costs due to air pollution in the

(2) Lave, L.B. and Seskin, E.P. Air Pollution and Human Health. Science 169(3947):723, 1970

U.S. in 1963 were \$4.16 billion. In order to relate this data to the Ontario situation, the consultants calculated that Lave and Seskin's estimate was approximately 0.7 percent of the U.S. gross national product in 1963. By taking a similar percentage of Ontario's 1978 gross provincial product, the consultants arrived at a health burden in Ontario of \$640 million due to air pollution from all sources.

The second method used by the consultants was to relate Lave and Seskin's estimate to the total economic burden of ill health in the U.S. Using an independant estimate of the total health burden in Ontario, the authors were able to calculate that the portion attributable to air pollution was some \$640 million in 1978. This method resulted in the same estimate as the first method.

The third method was to use estimates developed by Lave and Seskin for the reductions in the levels of morbidity and mortality from various diseases which would result from a 50 percent reduction in air pollution. The reductions in disease were then related to Ontario health cost data. This method yields an estimate of \$612 million for the total health cost in Ontario due to air pollution.

To relate these estimates to its own operations, Ontario Hydro used a consultant's model which shows that power generation in Ontario is responsible for 1.24 percent of ground level concentrations weighted by population exposed and toxicity of emissions. The Applicant divided the resulting costs by the generation in 1978 at Lakeview, Lambton and Nanticoke, and, after

allowing for inflation, concluded that the social costs due to health effects are somewhere in the range of zero to 0.26 mills per kW.h (1980 dollars).

3.11.2 Building Materials

Damage to zinc, paint, concrete, building stone, aluminum, copper, nickel, tin, brick and glass used in buildings and structures was calculated using methodology developed by Salmon⁽³⁾, who related levels of U.S. ambient ground-level concentrations of sulphur dioxide and particulates to the cost of damage. Ontario Hydro's consultants related Salmon's work to the Ontario situation by calculating Ontario Hydro's contributions to the concentrations of sulphur dioxide and particulates within 30 km of the major coal-fired generating stations. The amounts of each of the materials under study located near the generating stations were then estimated from the annual amounts of each material consumed in the province. From this, potential annual damage to each material due to Ontario Hydro's emissions was calculated. The amounts were summed and divided by total emissions to calculate costs on a per kilowatt hour basis.

Potential soiling costs were calculated based on the annual cost of cleaning exterior walls and windows of buildings in the areas around major coal-fired stations. The total estimated potential costs from damage and soiling is 0.05 mills

(3) Salmon, R.L. Systems Analysis of the Effects of Air Pollution on Materials. Midwest Research Institute. 1970

per kW.h. As remedial action is not always taken, Ontario Hydro estimated the costs to range from zero to 0.05 mills per kW.h (1980 dollars).

3.11.3 Textiles

The consultants' report on air pollution effects on textile materials assesses the costs of damages to textiles in the areas around Nanticoke, Lakeview and Lambton generating stations. It concludes that an accurate assessment of the cost of textile degradation and cleaning directly attributable to air pollution is very difficult due to insufficient scientific evidence. Particulate levels encountered in Toronto may give rise to some excess soiling costs but other factors are much more significant causes of laundering. Costs of air pollution effects on textile materials were estimated to range from zero to \$10 million per year from all sources of air pollution. Ontario Hydro estimated that its contribution to these costs, based on weighted averages for the three generating stations, range from zero to 0.00035 mills per kW.h (1980 dollars).

3.11.4 Water Quality

This report concerned itself with the quality of inland lakes in the Haliburton-Muskoka area. A previous study determined that the Great Lakes are relatively insusceptible to acidification due to adequate buffering. The Haliburton-Muskoka study area was chosen due to a number of factors. The study area is on the Precambrian Shield, beyond which lakes are well-buffered and not susceptible to acidification. Georgian Bay borders the area on the west. North of Lake Nipissing, Ontario

Hydro's contribution to sulphate loading rates were said to be obscured by emissions from the Sudbury area.

The study employs a computerized long-range transport and deposition model from which it was determined that Ontario Hydro's contribution to acid loading in the study area is approximately 2 to 4.2 percent of the total. The study estimates the value of sport fishing in the area lost due to Ontario Hydro's operations. It estimates the direct cost attributable to Ontario Hydro's fossil-fired generation to be \$1.07 million annually. This equates to an incremental cost of 0.04 mills per kW.h (1980 dollars).

3.11.5 Vegetation and Animals

The consultants' report states that only ozone approaches ambient levels known to be toxic to plants or to affect crop yields. Ozone is not produced by Ontario Hydro generating stations. The consultants reported that long-term studies are required to determine if there are any effects of acidic precipitation on crops but that such effects appear to be unlikely in light of the existing evidence. The section of the report on animals focuses on possible effects of trace elements. It states that the contribution of generating stations to ambient levels is generally several orders of magnitude lower than ambient air quality criteria. No effect on animals is reported. Ontario Hydro concluded that no damage to vegetation or animals is identifiable and hence no social cost is attributable.

3.11.6 Property Values

The consultant attempted to find a mathematical relationship between ambient air pollution levels and property

values in Toronto. The report states that no correlation was found.

3.11.7 Summary

The application includes a table in which the social costs from each effect described above are summarized and totalled. The overall social costs attributable to Ontario Hydro's coal-fired generation are stated to range from zero to 0.35 mills per kW.h (1980 dollars).

CHAPTER 4

THE EVIDENCE: INTERNATIONAL POWER LINE

4.1 General Description

The route of the proposed new 345 kV double-circuit interconnection is shown in Appendix 8. The Canadian terminal of the line is the existing Sir Adam Beck 230 kV Switch Yard. From the switch yard, Ontario Hydro would construct two 230 kV circuits 0.49 kilometres to the location of the proposed 230/345 kV autotransformers. From the autotransformers, two 345 kV circuits would run 0.42 km to the U.S. border in the middle of the Niagara River. In the U.S., the lines would continue 0.24 km to the headworks of PASNY's Robert Moses Niagara Generating Station and thence 1.4 km through a tunnel to PASNY's 345 kV switch yard. Technical details of the line are provided in Appendix 9.

Under normal conditions the summer throughput of the proposed line would be approximately 1250 MVA per circuit, limited by the capacity of the autotransformers. The overall export capacity of the international power lines at Niagara Falls would be increased from about 510 MW to about 1500 MW.

Construction would take place during 1982 and 1983 with an expected in-service date of 31 December 1983. Construction of the line would require relocation of the towers carrying the two 230 kV international power lines authorized under Certificate EC-16. The lines would increase in length from 1.03 km to

1.1 km. The application includes a request to amend EC-16 accordingly.

4.2 Estimated Cost and Economic Feasibility

The total estimated cost of the facilities to be constructed in Ontario would be approximately \$20 million, composed as follows:

	<u>\$(1980)</u> <u>MILLIONS</u>
Station work	6.6
Install 2 autotransformers	10.2
Upgrade 230 kV breakers	2.7
Towers and river crossing	<u>0.7</u>
TOTAL	20.2

The Applicant indicated that its agreement with PASNY would provide for equal sharing of the cost of establishing the interconnection. The total estimated cost of the work in New York is approximately \$40 million. As the total cost of the interconnection would be about \$60 million, the cost to Ontario Hydro would be in the order of \$30 million (1980 dollars).

A witness for Ontario Hydro testified that the increased transfer capacity provided by the proposed line, and a NYPP analysis of expected market conditions in New York, indicate that Ontario Hydro would likely be able to export an additional 3000 GW.h per year. Under these circumstances, the

line would pay for itself in four months. The witness pointed out that even if increased sales were only 10 percent of the expected quantities, the profits would pay Ontario Hydro's costs in four years. He stated that the economic life of the new facilities is expected to be between 25 and 30 years.

4.3 Environmental Impact of the Line

The Applicant considered a number of alternative methods of increasing its interconnection capacity with New York. Constructing additional interconnection capacity in the Cornwall area was rejected because the internal transmission systems in both Ontario and New York are insufficient to carry the additional power. The only other potential sites are in the Niagara Falls area. Consideration was given to different voltage levels as well as the recommended level of 345 kV. The 500 kV option was eliminated because neither system has that voltage level in its Niagara-area switching stations and it would require new transformers at both ends. The 230 kV option was rejected because it would be more expensive than 345 kV.

Consideration was given to upgrading existing interconnections at Niagara Falls to 345 kV. Upgrading circuits BSC 106 North and South was rejected because it would require extensive tunnelling in Canada, structural reinforcement of the roof of Sir Adam Beck Generating Station, and would interfere with an existing freeway in New York. Upgrading circuits BSC 105

North and South was rejected because it would require disturbing the Bloody Run Creek Toxic Waste Dump area to install new transmission towers. The application states that the proposed route is recommended because it has the least overall environmental impact, it takes advantage of an existing transmission line right-of-way in Ontario between the proposed site for the autotransformers and the edge of the Niagara River gorge, and its cost is likely to be significantly less than that of any alternative. The major environmental impact associated with the international power line would be visual. The Applicant pointed out that the area is visually dominated by existing power generation and transmission facilities and that the additional impact of the proposed crossing is unlikely to be severe. Appropriate plantings would be used to mitigate visual effects. Almost all of the facilities in Ontario would be constructed on land owned by Ontario Hydro.

Evidence shows that the electric field strength, radio noise, audible noise, and ozone levels will all be at or better than acceptable levels. Ontario Hydro's design attempts to minimize radio and television interference by reducing corona discharge. This is facilitated by using two-bundle conductors and corona-free hardware. Ontario Hydro identified a chain link fence as the only metallic structure along the right-of-way. To avoid the possibility of electric shocks, the fence would be grounded.

CHAPTER 5

INTERVENTIONS

5.1 The Association of Major Power Consumers of Ontario

AMPCO's intervention endorses the application by Ontario Hydro. It states that the financial returns which will accrue if the application is granted should significantly assist in maintaining competitive power rates in Ontario.

The intervention raised a number of issues. AMPCO requested the Board to ensure that the construction of the proposed international power line would not reduce the reliability of the Applicant's system. The Applicant's witnesses testified that the line would improve the reliability of the system. AMPCO also expressed concern that the information relating to the economic feasibility of the proposed international power line might not be satisfactory to the Board. Under cross-examination, AMPCO's witness testified that he had no doubt whatever that the interconnection would pay for itself very quickly.

The intervention expresses concern regarding Ontario Hydro's pricing policy for capacity sales. It states that while Ontario Hydro enjoys favourable borrowing rates because it is a public corporation, most of the export customers are investor-owned utilities with higher borrowing costs. Capacity exports might therefore be under-priced if they were based on capital costs in Ontario. Ontario Hydro's witnesses stated that

capacity charges are not based on its capital costs but rather on costs of alternative sources in the U.S. AMPCO's witness stated that exports of miscellaneous firm power should be priced to recover fixed costs associated with the generating station used to produce the export energy. Under cross-examination by counsel for the Applicant, he testified that recovery of capital costs should be an objective but not a criterion. He conceded that it would be preferable to make a sale at the highest price which could be negotiated rather than to forego sales because they might not recover certain fixed costs.

The witness suggested that the Board require the Applicant to publish a notice whenever it applied to the Board for approval of a contract for miscellaneous firm power. He indicated that this would provide a streamlined process to allow interested parties to object to the proposed sale. He said it would be up to the Board to decide how it would deal with such a protest if one were received.

5.2 Energy Probe

Energy Probe intervened in opposition to the applications for miscellaneous firm and interruptible licences on the grounds that the social, environmental, and economic costs of exporting electricity to the United States is unacceptably high. It did not take a position on the application for a licence to export circulating power and energy or on the certificate application. Energy Probe's counsel participated in cross-examination of the Applicant's witnesses and called four witnesses to testify on behalf of Energy Probe.

A biologist employed by the Wildlife Toxicology Division of the Canadian Wildlife Service testified regarding the mechanisms whereby acidic precipitation can affect wildlife and its habitats. She testified that lake acidification can greatly increase concentrations of trace metals such as mercury, lead and cadmium and described the effects on animal life of long-term chronic exposures to such trace metals. She stated that the report dealing with animal life prepared by Ontario Hydro's consultants did not provide sufficient information to evaluate the impact of exports on wildlife. Under cross-examination she stated that she had not estimated Ontario Hydro's contribution to acidic depositions in Ontario and had no information to contradict the Applicant's estimates. She stated she had made no estimate of the related social costs.

An expert on oceanography, limnology and long-range transport of air pollutants employed by the Canada Centre for Inland Waters described the effect of acidic precipitation on water quality. Under cross-examination he testified that over half the acidic deposition in Ontario comes from U.S. sources and that emissions from Ontario Hydro's generation do not all fall in Ontario nor are they evenly dispersed.

An architect employed by Heritage Canada testified regarding the mechanisms whereby buildings and building materials can suffer damage due to acidic depositions. He stated that the

report on building materials prepared by the Ontario Hydro consultants had failed to consider several types of damage and that as a result, Ontario Hydro's estimate of social costs due to damage to building materials should be multiplied by two.

An economist employed by Energy Probe presented a cost benefit analysis of the Applicant's proposed exports. His analysis concludes that the social costs of Ontario Hydro's coal-fired generation total 40.3 mills per kW.h, composed of 14.2 mills for health effects, 6.1 mills for damage to building materials and 20 mills for "dead lakes". A dead lake was defined as one which will no longer support a fishery. The estimates of health costs and building material damage are based in part on the same U.S. studies as those used by Ontario Hydro's consultants in their analyses and in part on other U.S. studies. Cross-examination established that Energy Probe's analyses did not adjust the findings of the U.S. studies to take into account lower population densities and lower ground-level concentrations of pollutants prevalent in Ontario. No attempt was made to model, or take into account, dispersion characteristics of Ontario Hydro emissions. The analyses assume that all of the emissions from the Applicant's coal-fired stations fall within the boundaries of Ontario. The witness conceded that this is a simplification which results in an over-estimation of social costs in Ontario. He said the over-estimation would be balanced out by the fact that no estimate was included for social costs

caused by the Applicant's emissions in parts of Canada outside Ontario. Energy Probe's estimate of the cost of damage to lakes is based on the assumption that the intrinsic value of a living lake to present and future generations is \$2420 per year. No clear derivation of this figure was provided.

Energy Probe's counsel argued that the applications for interruptible and miscellaneous firm licences should be rejected. He described the social costs calculated by Energy Probe as upper limits, and stated that the actual costs would probably be between those estimated by Energy Probe and those indicated by Ontario Hydro's consultants. He argued that there were shortcomings in Ontario Hydro's studies and, therefore, it had not been satisfactorily demonstrated that the benefits of exports would exceed the costs. He urged that the application be rejected until the Applicant performs further studies to eliminate the uncertainty. He argued that even if benefits slightly exceed costs, the application should be rejected because benefits would accrue only to Ontario Hydro customers whereas social costs would be more widely distributed.

He urged that if the application were granted, the term should be limited to two years to allow re-examination of costs in the light of additional studies currently under way. He said that any licence issued should contain a condition requiring

Ontario Hydro to commence installation of scrubbers at generating stations to be used for export purposes.

5.3 The Minister of Energy for Ontario

The Minister's intervention supported the application stating that the export of electricity is of benefit to and in the interest of the Province of Ontario and Canada as a whole, provided that the power is surplus to Canadian needs, that any social and environmental impacts are taken into account, and that the export price is adequate. Counsel for the Minister argued that the application should be granted as applied for.

CHAPTER 6

DISPOSITION

The Board has given careful consideration to all the evidence and submissions presented.

6.1 Applications for Export

Section 83 of the Act requires the Board, in examining an application for an export licence, to have regard to all considerations that appear to it to be relevant. Without limiting the generality of the foregoing, the Board is required to satisfy itself that the power to be exported is surplus to reasonably foreseeable Canadian requirements and that the price to be charged is just and reasonable in relation to the public interest.

6.1.1 Circulating Licence Application

Circulating power is an unavoidable characteristic of interconnected system operation. Such a licence is required if Ontario Hydro is to remain interconnected with U.S. utilities. Circulating power is exported at one point on the international boundary and simultaneously reimported at another point. Since there is no net export involved there is likewise no question of surplus and therefore no question of export price.

The Applicant has clearly demonstrated the benefits which are derived from interconnected operation. These include improved system reliability, reduced operating reserve requirements, lower transmission losses and improved stability. No intervenor opposed this part of the application. The Board is satisfied that the granting of a circulating licence with the

quantity and term applied for is in the public interest. The Board is therefore prepared to issue a licence to authorize exports of circulating power and energy up to 10 000 GW.h per consecutive 12-month period from 1 July 1981 to 31 December 1995. Upon the issue of the new export licence and subject to the approval of the licence by the Governor in Council, the Board will revoke EL-94, the existing licence for circulating power. The Applicant indicated that it would consent to such a revocation. Applicable terms and conditions for the export licence are set out in Appendix 10.

6.1.2 Miscellaneous Firm and Interruptible Licence Applications

6.1.2.1 Surplus

The total requested export quantity of 20 000 GW.h per consecutive 12-month period to the end of 1983 is based on the normal transfer capacity of the Applicant's existing international power lines. The total quantity would increase to 25 000 GW.h per consecutive 12-month period after 1983, based on the success of the application for a new certificate. The proposed interruptible licence would authorize exports up to the maximum capability of the existing and proposed international power lines. The authorized interruptible quantities would be reduced by the amounts actually exported under the requested miscellaneous firm licence.

Appendix 6 demonstrates that the Applicant will have surpluses exceeding 40 000 GW.h per annum under dependable streamflows in each of the first five years of the requested licence term. This is well above the total requested licence limit. In the later years of the licence period the available surpluses

will be smaller due to reductions in coal-fired generation to comply with the Ontario Government's acid gas emission reduction program. Dependable surpluses in those years range from 17 200 GW.h in 1989 to 7700 in 1990. The energy surplus figures in Appendix 6 are based on dependable streamflows, which are exceeded 98 percent of the years. Under median conditions, an additional 7700 GW.h is available each year. High flows can produce a further 2780 GW.h. It is clear that substantial quantities of energy will be surplus to Ontario Hydro's needs during the proposed licence term. Quantities far in excess of the requested licence limits will be available in some years. The Board is satisfied that the limits requested under the proposed interruptible licence are reasonable. Ample protection for Canadian requirements is provided by the standard conditions contained in interruptible licences which provide that such exports can be interrupted at any time to supply loads in Canada. The Board is satisfied that the energy proposed for export under the interruptible licence would be surplus to Canadian requirements.

In respect of the requested miscellaneous firm licence, the maximum proposed rate of export would be 1200 MW and the energy limit would be 10 500 GW.h per consecutive 12-month period. Appendix 5 indicates that there will be at least 3000 MW of surplus capacity at the time of the annual system peak load in every year of the requested term. The Board is satisfied that sufficient surplus capacity is available for Ontario Hydro to export 1200 MW at any time during the proposed term. In the event of unforeseen contingencies or emergency conditions,

miscellaneous firm exports could be interrupted to supply the Applicant's primary loads.

Appendix 6 indicates dependable annual energy surpluses ranging from a high of 55 439 GW.h in 1984 to a low of 7700 GW.h in 1990. The latter figure is less than the requested energy limit under the miscellaneous firm licence. Testimony showed that the possible advancement of the nuclear construction program, the scheduling of maintenance, the quantity, timing, and sulphur content of coal purchases, and possible purchases of surplus hydraulic energy from neighbouring systems all provide the Applicant with considerable flexibility to increase the amounts available for export.

Nevertheless, it is not clear at this time whether Ontario Hydro will have sufficient surplus available to commit exports of miscellaneous firm power and energy up to the requested annual limit of 10 500 GW.h during the entirety of the proposed licence term. It should be noted that final authorization for exports at the maximum level is not being requested at this time. The present application is for approval in principle of miscellaneous firm exports and any quantities contracted for export would be subject to the Board's re-examination and final approval before being committed to the export market. Such approval would only be forthcoming if the Board were satisfied at that time that the proposed export was surplus to Canadian requirements. Protection for Ontario requirements is inherent in the type of licence being applied for in that exports under the requested miscellaneous firm licence could be interrupted if needed to supply Ontario loads.

Protection for Canadian requirements outside Ontario is also provided. Exports of miscellaneous firm power would not be subject to interruption by neighbouring systems once they had commenced, but individual blocks would be offered to all accessible Canadian utilities before being committed to the export market.

The Board agrees with the Applicant's statements that a ten-year term would provide desirable marketing flexibility with this type of licence and therefore accepts the requested term and energy limit in principle. Sales of miscellaneous firm power would be arranged for terms of no longer than five years, subject to the availability of surplus, the needs of economically accessible interconnected Canadian utilities as determined by offers of sale, and finally the approval of each transaction by the Board. Under these conditions, which would be included in any licence which might be issued, the Board could satisfy itself that the quantities to be exported are surplus to Canadian needs.

Hydro-Québec's response to Ontario Hydro's letter of offer requested that any miscellaneous firm licence contain a condition requiring that the export be interrupted if, in the Board's opinion, an unforeseen situation could cause interruption in the supply of guaranteed power to consumers in accessible Canadian markets. This condition is the same as one of the conditions in EL-96, Hydro-Québec's licence for the export of firm diversity power to PASNY.

Hydro-Québec's letter does not include any reasons for this request nor did Hydro-Québec intervene at the hearing to support it. Consequently, the Board has little evidence before

it with which to evaluate Hydro-Québec's suggestion. There are a number of differences between today's circumstances and those prevalent in 1976. Ontario Hydro, in its intervention at the 1976 hearing of Hydro-Québec's application, expressed serious concern about its system's reliability and its continuing ability to meet the Ontario load. Since then, the load growth in Ontario has been much less than expected. Hydro-Québec's application was for a term of twenty years whereas the maximum firm commitment under Ontario Hydro's application would be for five years. In the light of the changed circumstances, and lacking any compelling reason to do so, the Board is not prepared to condition the proposed licence in the manner suggested by Hydro-Québec.

Hydro-Québec's interest would be protected by its right of first refusal on each block of firm power. Appendix 5 shows that at all times Ontario Hydro will have ample surplus capacity over and above the proposed export quantities to provide assistance to neighbouring Canadian systems in the event of unforeseen emergencies.

From the foregoing, and subject to approving exports of miscellaneous firm power as contracts are entered into, the Board is satisfied that the terms and licence limits requested by Ontario Hydro are reasonable and that the power and energy proposed for export will be surplus to reasonably foreseeable Canadian requirements.

6.1.2.2 Environmental Impact and Social Costs of Exports

The Board notes that the Applicant meets all Federal and Provincial environmental regulations to which it is subject. It is the Applicant's policy to reduce or completely eliminate exports in order to avoid exceeding the applicable regulations.

In respect of possible nuclear generation for export, the Board accepts the Applicant's statement that since the emissions from its nuclear station are only a very small percentage of the applicable limits, any increased operation would have insignificant impact. Regarding water quality, the evidence shows that Ontario Hydro meets the governmental regulations at all times in order to supply the Ontario load and would not exceed them in order to make exports. It follows that generation for export would not create any problem regarding water quality.

As with other environmental criteria, the Applicant meets all applicable environmental standards regarding airborne emissions from its fossil-fired generation. It therefore appears unlikely that incremental generation for export would create any unacceptable impact. Nevertheless, it is possible that generation for export might cause incremental environmental effects. It is such effects which the social cost studies submitted by the Applicant and Energy Probe attempt to measure.

Measuring Ontario Hydro's contribution to the subtle types of effects outlined in the social cost studies is very difficult. Measuring any resulting social costs is even more difficult. In the Board's view it is likely that, in at least some parts of Canada, deposition of airborne pollutants has little or no effect because threshold limits are not exceeded. It is clear that some types of effects, such as the effect of pollution on property values, either do not appear or cannot be measured. In spite of the difficulty of endeavour in this area,

the Board recognizes the general quality of the studies prepared by Ontario Hydro's consultants. The underlying assumptions and methodology are clearly delineated and the subjects are fully researched.

For the most part, the underlying assumptions made in the cost benefit study presented by Energy Probe are less clearly stated. In addition, its methodology raises certain questions. Of particular concern are the direct use of U.S. data with no attempt to correct for lower population density and better air quality in Canada, the failure to take into account dispersion effects of Ontario Hydro emissions, and the adoption of arbitrary estimates of costs such as that used for the value of a lake.

Energy Probe argued that the studies presented by Ontario Hydro left some effects unmeasured. However, no hard evidence that such effects are caused by Ontario Hydro nor any means of quantifying them were presented at the hearing.

For the foregoing reasons, the Board accepts Ontario Hydro's estimates of social costs due to its atmospheric emissions as the best available. Reassurance may be found in Ontario Hydro's argument that social costs would still be recovered by export profits, even if they have been underestimated by a factor of ten.

Energy Probe's counsel suggested that any export licence be conditioned to require Ontario Hydro to install scrubbers at stations used to generate energy for export. Ontario Hydro's generating stations are constructed to supply the Ontario load and come under Provincial control. The Board

notes that Ontario Hydro has embarked on a program to install scrubbers at some of its generating stations. For these reasons the Board is not prepared to adopt Energy Probe's suggestion.

6.1.2.3 Export Prices

The Board has developed three criteria for evaluating electricity export prices to ensure that they are just and reasonable in relation to the public interest. These are that the export price shall recover its appropriate share of the costs incurred in Canada, that it shall not be less than the price for equivalent service to Canadian customers, and that it shall not result in prices in the export market area which are materially less than the prices which would result from the least cost alternative.

In respect of costs incurred in Canada, the Board accepts the Applicant's testimony that none of its facilities, except for the proposed new international power line, are being constructed to make exports. The economic feasibility of the line will be dealt with later in the report. The Applicant testified that it would never export energy at less than the applicable incremental costs plus ten percent, as set out in the interconnection agreements. Export prices for economy sales are based on the split-savings formula. The Board notes that the Applicant includes its estimate of social costs in its calculation of the total incremental cost. In addition to the energy price, capacity sales under the interruptible and miscellaneous firm licences would include a demand charge. The Board is satisfied that the Applicant's proposed export pricing

arrangements would recover all costs incurred in Canada. In addition to recovering costs, the evidence shows that exports have been very profitable in the past, and that this is expected to continue. The profits directly benefit Ontario Hydro's customers by reducing rates.

AMPCO suggested that exports of miscellaneous firm power should be priced to recover capital costs associated with Ontario Hydro's generating stations. The fixed costs must be paid whether there are exports or not. The Board agrees with Ontario Hydro that its goal in negotiating export prices should be to maximize its profit as best possible, without using specific fixed costs as criteria.

In respect of the price for equivalent service to Canadians, the Board notes that exports under the interruptible licence could be preempted at any time by any accessible Canadian utility willing to pay the export price. Possible differences in the cost of delivery would be taken into account. Exports under the miscellaneous firm licence would be offered to neighbouring Canadian utilities at the export price before being committed to the export market. The Board therefore concludes that the export prices will not be less than the cost to Canadians for equivalent service.

In respect of the third criterion, the evidence shows that the alternatives available to export customers are purchases from other utilities. Examination of interconnection agreements between U.S. utilities shows that the Applicant's pricing formulas, namely cost plus ten percent or split-savings, are in

widespread use. Demand charges in U.S. agreements are comparable to those of the Applicant. The alternative to purchases of miscellaneous firm power from Ontario Hydro would also be purchases from other U.S. utilities under existing agreements or newly negotiated contracts. The time frame of the requested licence is insufficient to allow construction of new generation in the U.S. to be considered an alternative. Ontario Hydro's witnesses testified that they continuously monitor U.S. agreements and actual inter-utility transactions in the U.S. in order to price exports as closely as possible to their true market value. The Board is satisfied that Ontario Hydro's export prices will not result in prices in the market area which are materially less than those that would result from the alternatives.

The Board is satisfied that Ontario Hydro's pricing formulas and policies as described above will result in prices for power and energy which are just and reasonable in relation to the public interest. The evidence shows that the actual price to be charged for exports of miscellaneous firm power will be negotiated separately with each customer. As a condition of any licence which might be issued, the Board would require that contracts for such exports be submitted for the Board's approval. In this way the Board could, for each transaction, satisfy itself that the pricing formulas and policies are followed and that the actual prices to be charged are therefore just and reasonable in relation to the public interest.

AMPCO suggested that a notice be published to allow public participation when an individual contract for a

miscellaneous firm export is submitted for the Board's approval. The Board does not see this as a workable proposal. It would defeat the purpose of the present hearing which has already provided an opportunity for everyone to express his views. No intervenor has opposed Ontario Hydro's request for approval in principle of miscellaneous firm exports. To require such notice would create uncertainty and undermine the substance of this decision. In addition, it would substantially increase the time required for the Board to examine and respond to submissions by Ontario Hydro. It is in the public interest to keep delays to a minimum.

6.1.2.4 The Board's Finding

In view of the foregoing, the Board, having satisfied itself that the energy to be exported is surplus to reasonably foreseeable Canadian requirements and that the prices to be charged are just and reasonable in relation to the public interest, and having had regard to all other considerations that appear to it to be relevant, finds the export of power by Ontario Hydro to be in the public interest. Accordingly, the Board is prepared to issue a licence authorizing export of miscellaneous firm power of up to 1200 MW and energy up to 10 500 GW.h per consecutive 12-month period from 1 July 1981 to 30 June 1991. Applicable terms and conditions are set out in Appendix 11.

The Board is also prepared to issue a licence for the export of interruptible power and energy to a maximum of 20 000 GW.h per consecutive 12-month period from 1 July 1981 to 31 December 1983 and 25 000 GW.h per consecutive 12-month period

from 1 January 1984 to 30 June 1991, to be reduced by the amount of actual exports under the miscellaneous firm licence.

Applicable terms and conditions for the interruptible licence are set out in Appendix 12.

6.2 The International Power Line

Section 44 of the Act requires the Board in considering an application for a certificate to take into account all matters that appear to it to be relevant. In particular the Act states that the Board may have regard to the availability of power for the line, the existence of markets, the economic feasibility of the line, the financing, and any public interest that may be affected by the granting or refusing of the application.

The availability of power and the existence of markets have been demonstrated in previous sections of this report. The financing of the line would constitute a minor portion of the Applicant's general capital program. The Board is satisfied that the line would be economically feasible. Under anticipated conditions, the cost of constructing the line would be recovered in four months.

The Applicant undertook to submit an executed copy of its agreement with PASNY to construct and operate the new line as soon as it is available. Accordingly, any certificate would contain a condition requiring Ontario Hydro to file the agreement for the approval of the Board before commencing construction.

The Board is satisfied that the construction and operation of the line would have minimal environmental impact. The line is very short and most of the construction would be on

land owned by Ontario Hydro. There would be some unavoidable visual impact, but it would be slight due to the prevalence of generation and transmission facilities in the area. No intervenor opposed the line's construction.

The Applicant does not intend to commence construction of the interconnection until 1982 with an expected in-service date of 31 December 1983. The certificate is being applied for at this time because the facilities are needed to permit the delivery of the requested export quantities after 1983. In addition, the new interconnection will improve system reliability. Accordingly, having taken into account all matters that appear to it to be relevant, and having satisfied itself that the line is and will be required by the present and future public convenience and necessity, the Board is prepared to issue to Ontario Hydro a certificate of public convenience and necessity for the Canadian portion of the new interconnection. Applicable terms and conditions are set out in Appendix 13.

Construction of the new interconnection will require Ontario Hydro to increase slightly the length of the two existing international power lines certified under EC-16 and, consequently, Ontario Hydro has applied for an order to amend EC-16. The Board is satisfied that it is in the public interest to grant the application and is prepared to issue the appropriate amending order subject to the approval by the Governor in Council of the issuance of the new certificate.

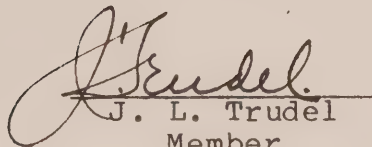
6.3 Recapitulation

Having regard to the foregoing considerations, findings, and conclusions, and having taken into account all

matters that appear to it to be relevant, the Board is prepared to issue the three licences and the certificate applied for by Ontario Hydro upon the terms and conditions set out in Appendices 10, 11, 12 and 13. The Board will issue an order revoking Ontario Hydro's existing licence EL-94, effective 1 July 1981, subject to the approval by the Governor in Council of the new licence to authorize the export of circulating power and energy. The Board is prepared to issue an order to amend EC-16 as requested by the Applicant, subject to the approval by the Governor in Council of the issuance of the new certificate of public convenience and necessity.



L. M. Thur
Presiding Member



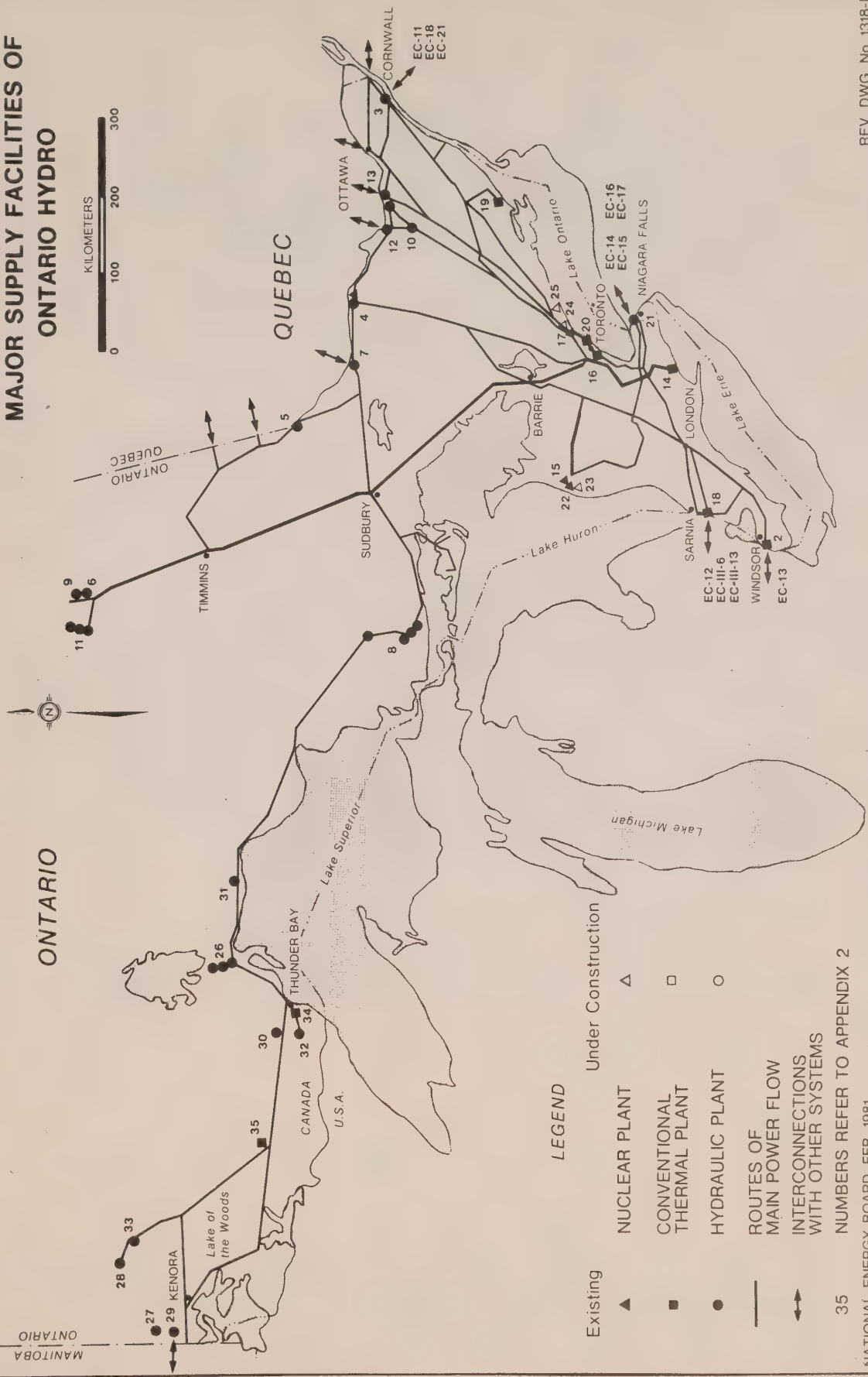
J. L. Trudel
Member



R. B. Horner
Member

Ottawa, Canada
May, 1981.

MAJOR SUPPLY FACILITIES OF
ONTARIO HYDRO



GENERATING PLANT NAME/PLATE CAPACITY

EAST SYSTEM

Hydraulic Plants Existing

1. Niagara River Plants

Sir Adam Beck No. 2 1224
Sir Adam Beck No. 1 415
Pumped Storage 177
Ontario Power 101

2. Welland Canal Plants

Decew Falls No. 2 115
Decew Falls No. 1 32

3. St. Lawrence (Saunders)

Des Joachims 912
Lower Notch 360
Abitibi Canyon 228
Otto Holden 234
205

8. Mississauga River Plants

Wells 203
Raynor 42
Aubrey Falls 130
Red Rock Falls 40
Otter Rapids 175

10. Madawaska River Plants

Stewartville 153
Barrett Chute 152
Mountain Chute 140

11. Matagami River Plants

Harmon 129
Kipling 125
Little Long Rapids 122

12. Chenaux

122

13. Ottawa Area

Chats Falls 89
Arnprior 74
Others, less than 100 MW 137

Total Hydro East System 5836

Thermal Plants Existing

14. Nanticoke (coal) 4000
15. Bruce A (nuclear) 3200
16. Lakeview (coal) 2400
17. Pickering A (nuclear) 2160
18. Lambton (coal) 2000
19. Lennox (oil) 2295
20. Hearn R.L. (coal, gas) 1200
21. Keith J.C. (coal) 264
22. Douglas Point (nuclear) 200
Others, less than 100 MW 451
Total Thermal East System 18170

Authorized

23. Bruce B (nuclear) 3400
24. Pickering B (nuclear) 2160
25. Darlington (nuclear) 3600
Others, less than 100 MW 157

Total Authorized 9317

Total Existing East System 24006
Total Existing West System 737

Total Existing 24743

WEST SYSTEM

Existing Hydraulic Plants

26. Nipigon River Plants

Pine Portage 129
Cameron Falls 72
Alexander 65

27. Caribou Falls

77

28. Manitou Falls

72

29. Whitedog Falls

65

30. Silver Falls

45

31. Agassabon

41

32. Kakabeka Falls

24

33. Ear Falls

19

Total Hydro West System 609

Thermal Plants

34. Thunder Bay (coal) 100
Combustion Turbines 28

Total Thermal West System 128

Authorized

Thunder Bay Units

2 and 3 (coal) 300

35. Atikokan (coal) 400

Total Authorized 700

Numbers refer to location of generating plants shown on Appendix 1 (map).

ONTARIO HYDROINTERNATIONAL POWER LINES

Certificate Number	Location	Owner Outside Canada	Operating Designation	Voltage (kV)	Frequency (Hertz)	Nominal Winter Capacity (MVA) (1)
EC-12	Sarnia	Detroit Edison	B3N	230	60	590
EC-13	Windsor	Detroit Edison	J5D	230	60	570
EC-III-6	Courtright	Detroit Edison	L4D	345	60	800
EC-III-13	Courtright	Detroit Edison	L51D	345	60	880
EC-14	Niagara	Niagara Mohawk	BSC105-N	69	25	} 80
EC-15	Niagara	Niagara Mohawk	BSC105-S	69	25	
EC-17	Niagara	Niagara Mohawk	BSC106-N	69	25	} 85
EC-17	Niagara	Niagara Mohawk	BSC106-S	69	25	
EC-16	Niagara	Niagara Mohawk	BP76	230	60	550
EC-16	Niagara	PASNY	PA27	230	60	480
EC-18	Cornwall	PASNY	L33P	230	60	360
EC-11, EC-18	Cornwall	PASNY	L34P (2)	230	60	370
EC-21	Cornwall	PASNY	J3Bus	0.6	60	---

NOTES: (1) Capacity is the nominal winter capacity of the interconnection. The total permissible inter-change with each utility is not the arithmetic sum of the capacities of the interconnections.

(2) The J3 Bus is the service bus connecting the Ontario Hydro Saunders generating station to the PASNY Moses (St. Lawrence) generating station.

ONTARIO HYDRO
GENERATION EXPANSION PLAN
(megawatts)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>
<u>EAST SYSTEM</u>											
Hydro	31	11	24	16	-	-	-	-	-	-	-
Coal - Nanticoke	-	-	-	-	328	-	-	-	-	-	-
Combustion Turbines	70	-	28	-	56	-	-	-	-	-	-
Nuclear - Bruce	184	-	750	750	-	756	756	-	-	-	-
- Pickering	-	-	1038	1038	-	-	-	-	-	-	-
- Darlington	-	-	-	-	-	-	-	881	881	881	881
ANNUAL TOTAL	285	11	1840	1804	384	756	756	881	881	881	881
<u>WEST SYSTEM</u>											
Hydro	6	2	5	-	-	-	-	-	-	-	-
Coal - Thunder Bay	298	-	-	-	-	-	-	-	-	-	-
- Atikokan	-	-	-	206	-	-	-	206	-	-	-
ANNUAL TOTAL	304	2	5	206	-	-	-	206	-	-	-
TOTAL BOTH SYSTEMS	<u>589</u>	<u>13</u>	<u>1845</u>	<u>2010</u>	<u>384</u>	<u>756</u>	<u>756</u>	<u>1087</u>	<u>881</u>	<u>881</u>	<u>881</u>
CUMULATIVE TOTAL	589	602	2447	4457	4841	5597	6353	7440	8321	9202	10083

Figures represent dependable December net peak capacity.

ONTARIO HYDRO
CAPACITY, DEMAND AND SURPLUS
(megawatts)

EAST SYSTEM

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Capacity - Hydro	5 908	5 919	5 943	5 959	5 959	5 959	5 959	5 959	5 959	5 959	5 959
Thermal	11 973	11 973	11 973	11 973	12 301	12 301	12 301	12 301	12 301	12 301	12 301
Nuclear	5 248	5 248	7 036	8 824	8 824	9 580	10 336	11 217	12 098	12 979	13 860
Gas Turbines	515	515	543	543	599	599	599	599	599	599	599
Purchases	--	--	--	--	--	--	--	--	--	--	--
Total Dependable Capacity	23 644	23 655	25 495	27 299	27 683	28 439	29 195	30 076	30 957	31 838	32 719
Maintenance	--	--	--	--	843	843	515	721	515	515	--
NET DEPENDABLE CAPACITY	23 644	23 655	25 495	27 299	26 840	27 596	28 680	29 355	30 442	31 323	32 719
Peak Demand (20 Minute)	16 360	16 859	17 457	18 077	18 761	19 449	20 173	20 933	21 741	22 594	23 385
Interruptible Load	493	516	541	572	626	656	656	656	656	656	656
Managed Load	--	--	--	--	--	--	200	400	600	800	1 000
Net Firm Demand	15 867	16 343	16 916	17 505	18 135	18 793	19 317	19 877	20 485	21 138	21 729
Required Reserve	3 967	4 086	4 229	4 376	4 534	4 698	4 829	4 969	5 121	5 285	5 432
TOTAL DEMAND	19 834	20 429	21 145	21 881	22 669	23 491	24 146	24 846	25 606	26 433	27 161
SURPLUS	3 810	3 226	4 350	5 418	4 171	4 105	4 534	4 509	4 836	4 900	5 558

WEST SYSTEM

Capacity - Hydro	590	592	597	597	597	597	597	597	597	597	597
Thermal	398	398	398	604	604	604	604	810	810	810	810
Gas Turbines	29	29	29	29	29	29	29	29	29	29	29
Purchases	150	--	--	--	--	--	--	--	--	--	--
Total Dependable Capacity	1 167	1 019	1 024	1 230	1 230	1 230	1 230	1 436	1 436	1 436	1 436
Maintenance	--	--	--	149	--	--	--	--	--	--	--
NET DEPENDABLE CAPACITY	1 167	1 019	1 024	1 081	1 230	1 230	1 230	1 436	1 436	1 436	1 436
Peak Demand (20 Minute)	875	901	919	963	1 020	1 054	1 093	1 138	1 187	1 235	1 278
Interruptible Load	--	--	--	--	--	--	--	--	--	--	--
Managed Load	--	--	--	--	--	--	--	--	--	--	--
Net Firm Demand	875	901	919	963	1 020	1 054	1 093	1 138	1 187	1 235	1 278
Required Reserve	307	307	307	393	417	409	401	507	493	482	470
TOTAL DEMAND	1 182	1 208	1 226	1 505	1 437	1 463	1 495	1 645	1 680	1 717	1 748
SURPLUS	-15	-189	-202	-275	-207	-233	-244	-209	-244	-281	-312

Figures are for the month of December, the month in which the annual peak load is expected to occur.

East and West System peaks are not additive due to diversity.

ONTARIO HYDRO
ANNUAL NET ENERGY CAPABILITIES, LOADS AND SURPLUS
DEPENDABLE STREAMFLOWS
(gigawatt hours)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>
<u>EAST SYSTEM</u>											
Generation - Hydro	24 409	24 409	24 409	24 475	24 412	24 412	24 412	24 475	24 412	24 412	24 412
- Thermal	74 067	76 346	76 365	77 748	77 515	41 064	36 692	36 012	34 055	27 071	24 359
- Nuclear	37 675	37 470	42 962	57 393	59 582	58 829	67 834	71 109	82 992	85 766	97 995
- Gas Turbines	2 672	2 870	2 919	3 031	3 198	3 334	3 334	3 344	3 334	3 334	3 334
Firm Purchases	2 000	-	-	-	-	-	-	-	-	-	-
TOTAL CAPABILITY	140 823	141 095	146 655	162 647	164 707	127 639	132 272	134 940	144 793	140 583	150 100
Primary Demand	96 413	99 501	102 789	106 753	110 511	114 681	118 830	123 681	128 072	133 086	137 743
Transfer to West System	682	365	556	485	22	118	335	152	23	49	158
TOTAL LOAD	97 095	99 866	103 345	107 238	110 533	114 799	119 165	123 833	128 095	133 135	137 901
SURPLUS	43 728	41 229	43 310	55 409	54 174	12 840	13 107	11 107	16 698	7 448	12 199
<u>WEST SYSTEM</u>											
Generation - Hydro	2 861	2 861	2 861	2 869	2 861	2 861	2 861	2 869	2 861	2 861	2 861
- Thermal	1 323	2 615	2 686	2 999	4 171	4 221	4 252	5 358	5 641	5 690	5 722
- Gas Turbines	171	171	171	172	171	171	171	172	171	171	171
Firm Purchases	1 021	302	-	-	-	-	-	-	-	-	-
TOTAL CAPABILITY	5 376	5 949	5 718	6 040	7 203	7 253	7 284	8 399	8 676	8 722	8 754
Primary Demand	5 962	6 161	6 268	6 495	6 862	7 211	7 526	7 858	8 195	8 519	8 811
Transfer from East System	682	365	556	485	22	118	335	152	23	49	158
REMAINING LOAD	5 280	5 796	5 712	6 010	6 840	7 093	7 191	7 706	8 172	8 470	8 653
SURPLUS	96	153	6	30	363	160	93	693	502	252	101
Project Purchases	-	-	-	-	-	3 500	3 500	3 500	3 500	3 500	3 500
TOTAL SYSTEM SURPLUS	42 824	41 382	43 316	55 439	54 537	13 000	13 200	11 800	17 200	7 700	12 300

TOTAL SYSTEM SURPLUS for 1986 through 1991 has been adjusted to agree with Ontario Hydro's Exhibit 30A which shows the effect of the Ontario Government's acid gas emission reduction program. The figures shown under Thermal Generation, TOTAL CAPABILITY, and SURPLUS for the East System have been recalculated accordingly.

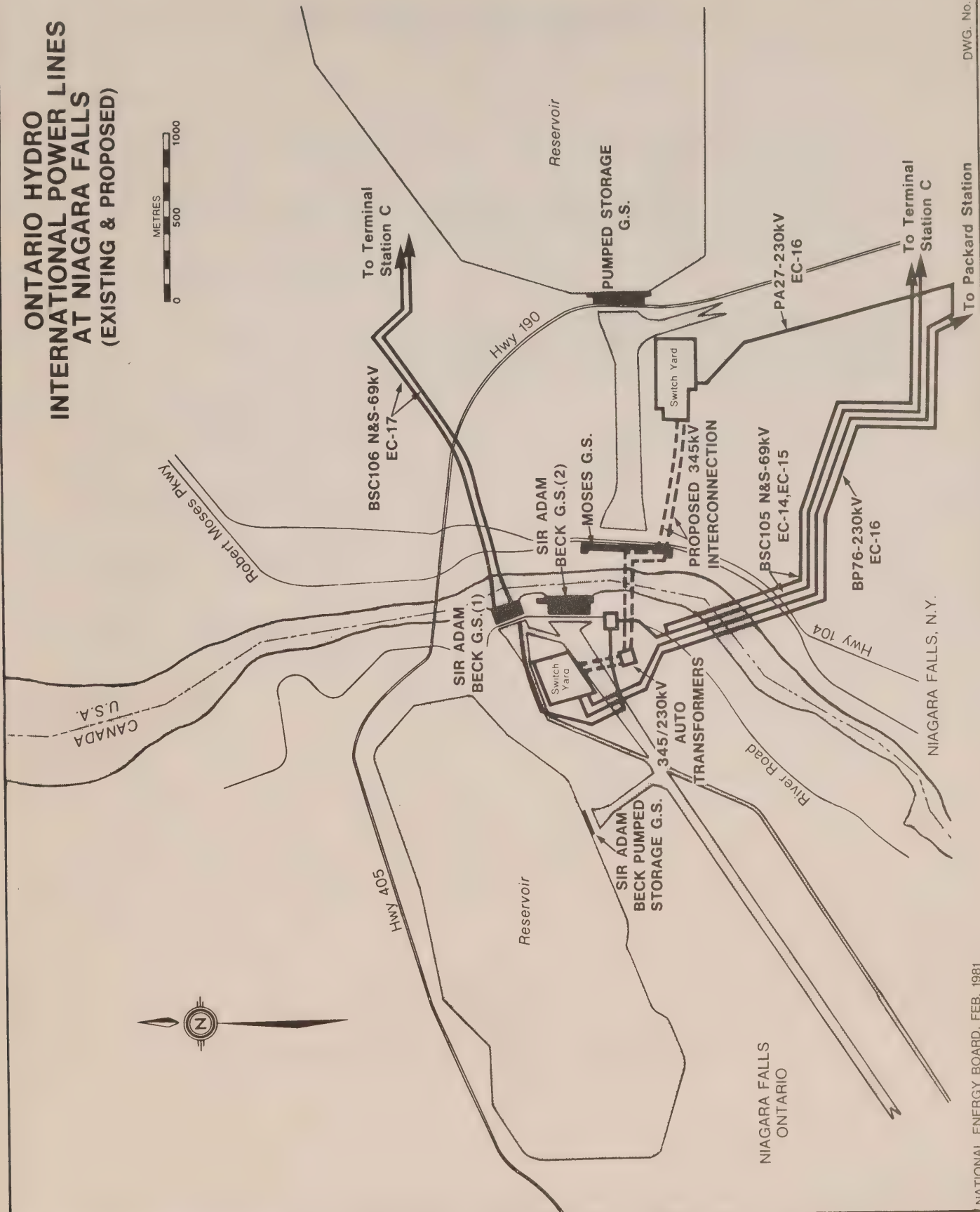
SUMMARY OF ONTARIO HYDRO'S INTERCONNECTION AGREEMENTS
WITH U.S. UTILITIES

NIAGARA MOHAWK	MICHIGAN UTILITIES	NYPP	PASNY
	<p align="center"><u>ECONOMY ENERGY</u></p> <p>Energy delivered in order to effect savings in the cost of generation when the purchaser has adequate generating capability to meet its load. ENERGY CHARGE based on split-savings or as agreed by the Operating Committee.</p>		
	<p align="center"><u>TERTIARY ENERGY</u></p> <p>Deliveries of energy which cannot be categorized under any other classification. CHARGES as agreed by the Operating Committee.</p>		
	<p align="center"><u>INADVERTENT ENERGY</u></p> <p>The difference between net actual interchange and net scheduled interchange. CHARGES: Energy will be balanced out or paid for as determined by the Operating Committee.</p>		
	<p align="center"><u>CAPACITY POWER</u></p> <p>Power and Energy supplied on a day-to-day basis to supplement the receiving party's generating capability in case of emergency or temporary deficiency on its system. DEMAND CHARGE \$120 per MW per day. ENERGY CHARGE greater of incremental cost plus 10% or as determined by the Operating Committee, but generally not less than for Economy Energy.</p>		
	<p align="center"><u>SHORT-TERM POWER</u></p> <p>Power and energy provided for one or more weeks to supplement the generating capability of the receiving party. DEMAND CHARGE \$600 per megawatt per week. ENERGY CHARGE greater of incremental cost plus 10% or as determined by the Operating Committee, but generally not less than for Economy Energy.</p>		
	<p align="center"><u>SHORT-TERM POWER</u> <u>SPECIFIC RESERVATION</u></p> <p>Short-term power reserved for five or more weeks at least eight months in advance. DEMAND CHARGE \$600 per</p>		

NIAGARA MOHAWK	MICHIGAN UTILITIES	NYPP	PASNY
	<p>MW per week increased by \$50 per MW per week for each year after 1978. ENERGY CHARGE greater of incremental cost plus 10% or as determined by Operating Committee but generally not less than for Economy Energy.</p> <p><u>SUPPLEMENTAL ENERGY</u></p> <p>Energy delivered from 22:00 to 8:00 hours and 24 hours on Sundays. DEMAND CHARGE \$2.50 per MW per hour. ENERGY CHARGE greater of incremental cost plus 10% or as determined by Operating Committee but generally not less than for Economy Energy.</p> <p><u>ANNUAL DIVERSITY POWER</u></p> <p>Power and energy exchanged or available to benefit from annual diversity. No charge except as agreed by the Operating Committee.</p> <p><u>COORDINATED OPERATION AND SERVICES</u></p> <p>Power and energy, including economy and capacity kilowatts, security energy, and optimization services, available to improve the reliability and quality of service of systems. Priced at cost, plus 10%, or split-savings depending on service provided.</p>	<p><u>OFF-PEAK ENERGY</u></p>	<p><u>UNIT RENTAL</u> <u>KILOWATT HOURS</u></p> <p>Energy delivered from generating units using the other party's water entitlement. CHARGE: Normally 0.75 mills per kW.h or as determined by the Operating Committee.</p>

NIAGARA MOHAWK	MICHIGAN UTILITIES	NYPP	PASNY
	<p><u>EMERGENCY ENERGY</u></p> <p>Energy provided for from 30 minutes to 6 hours per day. DEMAND CHARGE up to \$20 per MW per hour. ENERGY CHARGE not less than incremental cost plus 10%.</p> <p><u>LONG-TERM ECONOMY POWER</u></p> <p>Power and energy delivered to affect savings when both parties have adequate generating capability. RESERVATION CHARGE based on split-savings, ENERGY CHARGE as for Economy Energy.</p>		

ONTARIO HYDRO INTERNATIONAL POWER LINES AT NIAGARA FALLS (EXISTING & PROPOSED)



THE INTERNATIONAL POWER LINE
TECHNICAL DETAILS

General

Number of circuits	2
Phases per circuit	3
Frequency	60 hertz
Throughput per circuit (summer conditions)	1250 MVA

Each circuit by section

	Length (km)	Voltage (kV)	Type	Conductors	
				Size (kcmil) ⁽¹⁾	Number per Phase
Sir Adam Beck Switch Yard to autotransformers	0.49	230	ACSR ⁽²⁾	1843.2	2
Autotransformers to border	0.42	345	ACSR	932.7	2
Border to Moses G.S.	0.24	345	ACSR	932.7	2
Moses G.S. to 345 kV switch yard	1.40	345	copper in oil- filled cable	2500	1

(1) kcmil - thousands of circular mils

(2) ACSR - aluminum conductor, steel reinforced

TERMS AND CONDITIONS OF EXPORT LICENCE

UNSCHEDULED CIRCULATING EQUICHANGE

1. The term of this licence shall commence on the 1st day of July 1981 and shall end on the 31st day of December 1995.
2. The class of inter-utility export transfer authorized hereunder is an unscheduled circulating equichange carrier transfer of inadvertant power and energy for simultaneous return to Canada.
3. The power and energy to be exported hereunder shall be transmitted over any international power line for which a valid certificate of public convenience and necessity has been issued by the Board.
4. The quantity of energy that may be exported hereunder shall not exceed 10 000 GW.h in any consecutive 12-month period.
5. The Licensee, within fifteen days after the end of each month comprised in the term of this licence, shall file with the Board a report in such form and detail as the Board may specify, setting forth for that month
 - (a) the quantity of energy exported hereunder, and
 - (b) the corresponding quantity imported.

TERMS AND CONDITIONS OF EXPORT LICENCE
MISCELLANEOUS FIRM POWER

1. The term of this licence shall commence on the 1st day of July 1981 and shall end on the 30th day of June 1991.
2. The classes of inter-utility export transfer authorized hereunder are sale and exchange transfers of miscellaneous blocks of firm power and energy.
3. The energy to be exported hereunder shall be transmitted over any international power line for which a valid certificate of public convenience and necessity has been issued by the Board.
4. The Licensee shall not commit for export hereunder any block of power or energy for a period that exceeds five years.
5. The total quantity of power that may be exported hereunder shall not at any time exceed the lesser of
 - (a) 1200 megawatts, or
 - (b) the power that is surplus to the maximum foreseeable requirements of the Licensee's system after allowing for maintenance and required reserve.
6. (1) The quantity of energy that may be exported in any consecutive 12-month period within the term of this licence shall not exceed the lesser of
 - (a) 10 500 GW.h, or
 - (b) the sum of
 - (i) the dependable energy surplus approved by the Board in accordance with subcondition (2), and
 - (ii) any energy imported, or available for import under a firm commitment, as a return of energy exported hereunder.
- (2) The Licensee, before committing any block of power or energy for export hereunder, shall submit to the Board for its approval, an estimate, in such form and detail as the Board may specify, of the supply, demand and surplus of power and energy on its system for each month of the term of the proposed export.

7. The Licensee, before committing any block of power or energy for export hereunder,
 - (a) shall first offer such power or energy to all economically accessible interconnected Canadian electrical utilities on terms not less favourable to a purchaser, after appropriate adjustments for any differences in cost for delivery, than those on which the export would be made, and
 - (b) shall submit the proposed export agreement to the Board for its approval, together with copies of the offers referred to in subcondition (a) and the refusals thereto, and such other information as the Board may require, and shall not commence exporting until such approval is obtained from the Board.
8. The Licensee shall interrupt or curtail the delivery of energy hereunder whenever and to whatever extent such energy is required to supply any firm load in Ontario.
9. For energy generated by the burning of fuel oil, the incremental fuel cost used in any pricing formula under the agreements referred to in Condition 7(b) shall be
 - (a) for imported fuel oil, the price paid by the Licensee plus the amount by which that price was reduced by any subsidy or compensation payment from any level of government in Canada, and
 - (b) for fuel oil made from Canadian crude, the export price of such Canadian fuel oil, including any export charge.
10. The Licensee, within 15 days after the end of each month comprised in the term of the licence, shall file with the Board a report in such form and detail as the Board may specify, setting forth for each month,
 - (a) the quantities of power and energy exported hereunder,
 - (b) the price and resulting revenue,
 - (c) the quantities of energy imported as a return of energy exported hereunder, and
 - (d) the price and resulting cost of such imports.

TERMS AND CONDITONS OF EXPORT LICENCE

INTERRUPTIBLE POWER AND ENERGY

1. The term of this licence shall commence on the 1st day of July 1981 and shall end on the 30th day of June 1991.
2. The classes of inter-utility export transfer authorized hereunder are sale, equichange, storage, adjustment and carrier transfers of interruptible power and energy.
3. The power and energy to be exported hereunder shall be transmitted over any international power line for which a valid certificate of public convenience and necessity has been issued by the Board.
4. The quantity of energy that may be exported hereunder shall not exceed 20 000 GW.h in any consecutive 12-month period from 1 July 1981 to 31 December 1983 nor 25 000 GW.h during any consecutive 12-month period from 1 January 1984 to 30 June 1991, less actual exports under the miscellaneous firm licence to be issued pursuant to Appendix 11 of this report.
5. The Licensee shall not export power or energy hereunder unless it is surplus to the firm requirements of economically accessible Canadian markets at the time it is exported.
6. The Licensee shall interrupt or curtail the delivery of power and energy hereunder whenever and to whatever extent such power or energy is required to supply,
 - (a) any firm load within Canada, or
 - (b) any Canadian electrical utility willing to buy part or all of the power or energy at the same price as that of the export, adjusted for possible differences in the cost of delivery.
7. (1) Subject to subcondition (2), the price to be charged by the Licensee for power and energy exported hereunder as a sale transfer shall not be less than the price set forth for the applicable classification of transaction in
 - (a) the Interconnection Agreement of 29 January 1975 between Consumers Power Company, The Detroit Edison Company and Ontario Hydro, as amended,
 - (b) the Interconnection Agreement of 1 July 1979 between Niagara Mohawk Power Corporation and Ontario Hydro, as amended,

- (c) the Memorandum of Understanding of 19 January 1965 between the Power Authority of the State of New York and Ontario Hydro, as amended or
 - (d) the Interconnection Agreement of 1 March 1977 between the New York Power Pool and Ontario Hydro, as amended.
- (2) For energy generated by the burning of fuel oil, the incremental fuel cost used in any pricing formula under the agreements referred to in subcondition (1), shall be
- (a) for imported fuel oil, the price paid by the Licensee plus the amount by which that price was reduced by any subsidy or compensation payment from any level of government in Canada, and
 - (b) for fuel oil made from Canadian crude, the export price of such Canadian fuel oil, including any export charge.
8. The Licensee shall not, without the prior approval of the Board, amend, enter into any agreement in substitution for or in addition to, or terminate, any of the agreements referred to in Condition 7.
9. The Licensee, within fifteen days after the end of each month comprised in the term of this licence, shall file with the Board a report in such form and detail as the Board may specify, setting forth for each such month
- (a) the quantity of power and energy exported hereunder, classified as to types of transfer,
 - (b) the price and resulting revenue for transactions of each type,
 - (c) the price and quantities of all imports over the international power lines used to export power hereunder,
 - (d) the current month-end balance in each energy exchange account maintained by the Licensee with a utility in the United States of America.

TERMS AND CONDITIONS OF CERTIFICATE
FOR THE INTERNATIONAL POWER LINE

1. The international power line to be constructed pursuant to this certificate shall be owned and operated by Ontario Hydro.
2. The international power line shall extend from the Sir Adam Beck Switch Yard to a point on the international boundary line located in the Niagara River east of Lot 1, in the City of Niagara Falls in the Province of Ontario.
3. The route of the international power line shall be as described in the environmental report found in Exhibit 10 of the application.
4. The total length of the international power line shall be approximately 0.91 kilometres.
5. The international power line shall consist of two three-phase circuits constructed for 60 hertz operation and insulated
 - (a) for 230 kV operation with two 1 843 200 circular mil steel reinforced aluminum conductors per phase from the Sir Adam Beck Switch Yard to the location of the 230/345 kV regulating autotransformers, a distance of approximately 0.49 km, and
 - (b) for 345 kV operation with two 932 700 circular mil steel reinforced aluminum conductors per phase from the autotransformers to the international boundary line, a distance of approximately 0.42 km.
6. Ontario Hydro shall file an executed copy of its agreement with The Power Authority of the State of New York covering the construction and operation of the international power line for the approval of the Board, which approval shall be obtained before construction of the line is commenced.
7. The design of the international power line shall be as adduced in evidence before the Board and in accordance with applicable standards of the Canadian Standards Association.
8. Ontario Hydro shall implement or cause to be implemented both during and after the construction of the international power line the recommendations and practices for the protection of the environment as adduced in its evidence before the Board.

9. Ontario Hydro shall file a description and diagram of the metering facilities proposed in association with the international power line for the approval of the Board, which approval shall be obtained before the metering facilities are installed.
10. Ontario Hydro shall not make any changes in the international power line or in the terminal facilities of the said line at Sir Adam Beck Switch Yard or in the metering facilities without the prior approval of the Board.
11. If the international power line has not been placed in service by 31 December 1984, the certificate shall expire on that date or upon such later date as may upon application be fixed by the Board.

